DOCUMENT RESUME

ED 337 697 CE 059 431

TITLE	School and Industry. IRDAC Opinion.
INSTITUTION	Commission of the European Communities, Brussels (Belgium). Industrial Research and Development Advisory Committee.
PUB DATE	90
NOTE	52p.
PUB TYPE	Viewpoints (Opinion/Position Papers, Essays, etc.) (120)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	Business Responsibility; Career Choice; Career Guidance; Career Planning; Cooperation; Corporate Support; Elementary Secondary Education; Foreign Countries; *Industry; Labor Force Development; Labor Needs; Lifelong Learning; *School Business Relationship; Secondary Education; Technological Literacy
IDENTIFIERS	European Community

ABSTRACT

In 1989, the Industrial Research and Development Advisory Committee (IRDAC) of the European Community established a Working Party on education and training issues relevant to industry. A subgroup on schools and industry identified the dominant influences on initial and adult training policy for the 1990s and beyond: (1) the need to adapt it to meet the rapidly changing requirements of industry; (2) the short supply of young people; and (3) negative images of employment or of industry. The subgroup also identified the crucial role of schools in developing the necessary positive attitudes toward continuing training and reasons for industry involvement in school/industry links. IRDAC determined five important issues with regard to the school/industry interface: (1) challenges for education and training; (2) getting in touch with young people; (3) a question of image; (4) mobility between education and training tracks; and (4) the status and management of the teaching profession. Analysis of these issues led IRDAC to develop three main objectives: raising the overall level of technological literacy, preparing for and understanding the world of work, and encouraging the pursuit of scientific and technical careers. To achieve these objectives, IRDAC recommended a set of practical actions focusing on teacher awareness and training, the interface between schools and industry, and getting in touch with young people. (Five examples of school/industry practices policies considered for the report are appended.) (YLB)

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School and Industry

IRDAC Opinion

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School and Industry

IRDAC Opinion

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FOREWORD

European Education and Training, Human Resources and Competitiveness

The Technological Explosion and Skills Demand

The decades since the World War II have been a period of rapid and accelerating technological change fuelling increased industrial productivity and economic growth. New industries have been created both in the manufacturing[1] and service sectors. The same **technological advance has created a global market place and global competition** which continues to increase with the technologically driven development of the economies of the Pacific rim and other newly industrialised countries.

Today, markets for most products are global in scope and for high technology products the markets are driven by product innovation. Global markets for low-technology products are driven by price; although labour and capital costs and exchange rates are important factors in price, so also is the function of **process innovation. High technology concepts can be applied to the production process to drive down costs**. Europe in general (as the U.S.A.) have fallen behind Japan in the application of technology to production concepts especially in mature and traditional industries. The West has only recently begun to develop a multidisciplinary science of manufacturing and to give its study sufficient attention in university research and education.

There is a further factor in this globally competitive arena. Competitiveness depends not only on creating and applying new knowledge to innovate the product and the manufacturing process but it needs to be achieved **faster** than the competitors. Thus the time from research output to application across industry is decreasing rapidly and this accelerated technology transfer is aided by collaborative working between industry and academy (or other research centres) or by movement of research workers from academy to industry.

> *For nations to succeed in the creation of competitive advanced technology based industries will necessitate the mastery of the process of rapid transformation of research results into innovative industrial applications. There are indications that Europe is lagging on this front. For example in the field of biotechnology it has been reported that the numbers of employees in new U.S. biotechnology companies increased rapidly from 20 000 in 1982 to 200 000 in 1998, with Europe, facing equal opportunities in the field of biotechnology, witnessing a much slower growth rate required and qualified personnel (estimated at one third of the USA figure).*

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[1] Manufacturing is used here to denote all sectors of the productive (non-service) industry, including extraction, process and construction industry.

There can be no doubt that in this increasingly competitive world where the operations of manufacturing, services and government are becoming more knowledge intensive, **the winners will be those whose workforces are the best educated and trained at all levels**.

In the European Community the challenges of the integrated market beyond 1992 will be best met by those organisations whose workforces have the highest levels of professional education and vocational skills coupled with entrepreneurial leadership capable of exploiting and managing rapid technological change.

Small wonder, in the face of these trends, that **skills shortages are growing**, particularly in the key generic technologies, electronics and information technology, systems engineering, biotechnology and advanced materials. Further it is obvious that there is a great need to **improve industrial management** - especially in small and medium sized enterprises (SMEs) to create a wider understanding of the necessity to introduce new technology to develop products and production methods - to move from low technology products on shrinking markets to more advanced products on growing markets - and to improve quality as well as productivity.

Obsolescence of Knowledge and Continuing Education and Training

The information revolution, characterized by ever more powerful devices for storing, manipulating and retrieving knowledge, and controlling production processes, is rendering **much previous education and training obsolete**, or simply irrelevant. It is salutary to note that even if useful knowledge has a half-life as long as ten years, intellectual capital is then depreciating at 7%/year (which is a much higher rate than the recruitment of new graduates), with a corresponding reduction in the effectiveness of the workforce.

On these grounds alone it is necessary for industry to develop and adopt systems of continuing education and training to update existing staff ; if, as appears likely, the numbers of young people emerging with new knowledge from initial education and training are inadequate despite many Member State Governments (e.g. recently France and Portugal) undertaking to increase numbers in higher education - **the need for** continuing education and training will intensify particularly for **upgrading as well as updating the workforce**.

> *The demographic evolution of European population is such that by 2000 the number of retirements will overtake the new entrants to the labour force. The ageing of the population will also mean that Europe will have to compete with some of the newly industrialised countries like South-Korea and Singapore that will have a much younger work force (the average age in South-Korea is 10 years lower than in Europe) that will be more up-to-date and probably more highly qualified on average.*

Even if some of these challenges can be faced by additional investments in education and training, it must not be overlooked that this will require a formidable increase in the current number of trainers and teachers at all levels, in particular for adult training, as well as an upgrading and updating of the existing trainers.

The Chicken or the Egg ?

A penetrating study in the early 1920s by the Cambridge economist Alfred Marshall entitled "Industry and Trade" placed much emphasis on the role of education. At the time he wrote the greater part of British Industry was still reckoned as the most efficient in Europe; but he foresaw that Germany's system of training and education was likely to give it an increasing advantage in the more technical and scientifically based industries of the future.

With the rapid development of the German economy particularly of the past thirty years or so an increasing number of comparative research studies have been devoted to these issues. In particular the National Institute of Economic and Social Research in London in conjunction with the Technische Universität Berlin has carried out a series of such studies in specific industries which have demonstrated that the higher productivity achieved in Germany is fundamentally due to the general higher levels of skills as a product of the German vocational education and training systems. These studies including the 1986 Study "Relation between education, employment and productivity and their impact on education and labour market policies - a British-German comparison" published by CEDEFOP - the European Centre for the Development of Vocational Training - reinforces IRDAC's conviction that **the output of education and training systems** (including in particular Higher Education) in terms of both quantity and quality of skills at all levels is **the prime determinant of a country's level of industrial productivity and hence competitiveness**.

The same Alfred Marshall wrote that "Japan ... can hardly fail to become a teacher ere long". And so it has proved : **Japan produces more engineers per head of population than any Western country : Europe overall produces less than half per head**. Additionally participation rates in school until age 18 are at much higher levels than Europe *(95 % of young Japanese are in full-time education up to the age of 18; in Europe this appears to be less than 50 %)* and the percentage of pupils studying mathematics until 18 is extremely high by European standards (for example a 1983 study illustrated the gap by pointing out that 90% of all Japanese pupils do some calculus before they leave school compared with only 15% in the UK !)

Japan has enjoyed **rates of growth of productivity** over decades **many times greater than European rates**. It is just another illustration of the more **optimal use of the human resources** that is being made and which can also be measured in other ways : the participation of the population in the active labour force is much higher than in Europe; the enrollments in higher education are more numerous per head of population, and the stock of researchers approaches that of the European Community (with Japan having less than half the population). These are also areas where Europe is seriously lagging behind the USA.

A 1983 study, "Japan's Intellectual challenge" by Lawrence P. Grayson of the U.S. National Institute of Education describes **Japan's strong commitment to education, particularly engineering education**. It details the massive expansion of scientific and technical education at all levels both to provide the engineers and technicians needed by industry for growth and technical development and to produce the technically literate population required to facilitate the transfer and adoption of technology on which the nation's infrastructure has depended.

> *To illustrate this growth, in the 27 years from 1955 to 1982 the number of bachelors degrees in engineering awarded in Japan rose from 9 600 to 73 600 per annum, the U.S. annual figure being surpassed in 1967. By 1982, on a per capita basis, Japan was graduating 2.3 times as many engineers as the U.S.. Based on figures supplied by the U.S. Department of Labour this report demonstrated a very close correlation between the average annual rates of increase in engineering degrees and subsequent manufacturing productivity growth for both Japan and the U.S. over the years between 1950 to 1982.*

There are of course other factors that affect productivity and economic growth *(consider for instance the fact that the average number of hours worked per year by a Japanese employee is about 2000, compared with the 1600 as average of his European counterpart)* but there can be no doubt that the Japanese strategy (now followed by the South Koreans and others) of substantially increasing the numbers and the quality of engineers and technical staff as a pre-requisite to achieving the planned economic growth, has succeeded. And a **virtuous circle** has been created ! Quoting Grayson :

> *"Educational development and economic growth have been linked reciprocally in Japan. The increased quantity and quality of educated people have provided the manpower necessary for industrial development. In turn, economic growth has enabled the country to afford, and created the necessity for, the great expansion in the number of upper secondary school and college graduates."*

In the skills report (page 25) an example is given of potential shortages of Software Engineers in Japan where the forecast need to year 2000 is to more than double the numbers to 2 145 000 ! The existing numbers employed (let alone the projected increase) are huge by European standards but it is salutary to note that the Japanese electrical industry (largely Electronics and I.T.) grew by 13.3% p.a. between 1977 and 1988.

Understanding skills requirements

The forecasting of skills needs in the European Community and its individual Member States is not well developed and is largely based on past rates of growth and on the perceptions of industrial enterprises (many of which have had low growth rates or even decline in the case of some traditional and mature industries). It is arguable that this largely "bottom up" approach, which fails to take adequate account of new enabling technologies capable of improving competitiveness, will underestimate the demand for and changes needed in technical

manpower. In particular forecasts of the needs of SMEs and the potential growth of the service sector are lacking. The result may well be a vicious circle of restriction of supply and demand compared with the virtuous circle described above where education push and market pull are attuned.

Conclusion

The relationship between education and training and industrial competitiveness is a vital one. It is changing in nature in the face of the pace of technological change and associated global competition. IRDAC is convinced that the education and training issues related to industrial competence and competitiveness have an overriding importance in relation to the future well-being of Europe and its citizens.

Acknowledgements

IRDAC wishes to acknowledge the assistance given by the Secretariat of IRDAC Working Party 11. In particular it would like to express its appreciation for the work of Janet Smith of the COMETT Technical Assistance Office for the preparation and finalisation of this report.

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Summary and Recommendations

IRDAC, the Industrial Research and Development Advisory Committee of the European Community, established in 1989 a Working Party (WP 11) on education and training issues relevant to industry, in particular those related to the competitiveness of industry[1] across the European Community. IRDAC had recognised that scientific and technological R&D programmes across Europe could not be considered separately from the overall issue of the adequacy of both the numbers and the education and training of highly skilled scientists, engineers and technicians: skills that are needed to carry out innovative scientific research and to apply the fruits of the research to develop European industry's competitiveness in the face of the existing and growing challenges of the rest of the world. The Working Party created in 1990 two specific sub-groups, one on the school-industry interface, and one on skills shortages. This report is the result of the work of the first sub-group. The report was considered by the full Working Party then submitted to IRDAC which approved it in its current form in November 1990.

Though IRDAC is an advisory body concerning research and development, it became concerned about skills shortages, since there is evidence now that higher investment in technological R&D - a crucial area in which Europe must keep and improve its competitive position - might not produce the expected economic benefits due to lack of qualified people both to develop and exploit advanced and innovative products and processes. In this context, too little attention has been paid to the importance of the early years of education, primary through to secondary schooling, in the general debate on skills shortages.

The underlying issue and the purpose of this report can be summarized in the following paragraph :

> ***"Industry needs skilled and scientifically literate people. Schools lay the foundations for attitudes and skills in adult living and working. No young European should leave school scientifically and technologically illiterate. Any actions to prevent or remedy skills shortages in the labour force must filter down to the schools. An important strategy in this is the development of the school/industry interface, particularly through the development of different forms of partnerships."***

The analysis of these issues has led IRDAC to call for action regarding three main objectives :

1. **Raising the overall level of technological literacy**
2. **Preparing for and understanding of the world of work**
3. **Encouraging the pursuit of scientific and technical careers**

These objectives are described in more detail below.

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[1] In this report, "Industry" includes all sectors of industry, both services and manufacturing. Manufacturing comprises also production, construction and process industry.

1. Raising the overall level of technological literacy

- One of the biggest challenges facing European education and training systems is to raise the status of technical education at compulsory school level, and in addition to ensure that no person should leave compulsory schooling without a basic understanding of technology.

- Education and initial vocational training policies should be designed and constantly adjusted so that the skills output of the education and training systems are in balance with the needs of the skills market.

- The broader the provision of, and experiences within, general education, the wider the scope for young people to make their own decisions and pursue their own paths of excellence. The narrower the education on offer, the more difficult it is for young people to develop their full potential. A project approach, which involves design and problem solving, is an important component of a broad education.

- As a partner in the education and training process, industry should be consulted:
  - at compulsory school level on the content of curricula and be willing to assist schools in implementing aspects of the curriculum and the process of educational and vocational guidance.
  - in technical and vocational training, with a view to closer collaboration on structures, curriculum, skill requirements, certification and the provision of training.

- Industry should play a supportive, but active role with regard to teacher training, both for general education and technical/vocational schools and colleges, for example through the provision of industrial experience opportunities by sectoral and regional industrial organisations and by firms and trade unions, or by involvement of technical teachers in industrial research and development.

2. Preparing for and understanding of the world of work

In a world where the pace of change is accelerating, there is increasing recognition that schooling and educational attainment of the labour force is a significant factor in labour market flexibility and structural adjustment. Of particular concern to IRDAC are those experiences and opportunities within compulsory schooling which introduce young people to the world of work in general and those which increase the status of technical subjects by the time young people are making subject and career choices. IRDAC therefore considers that a major objective of education and training systems should be the **preparation for and understanding of the world of work** and makes the following recommendations:

- A substantial period of initial training leading to a recognised qualification and a school curriculum which bears some relevance to the industrial world and reflects its values, are essential for young people to move successfully from school into their working lives.

- The schools/industry interface should be an arena for co-operation at a practical level on schemes and initiatives which link the world of work to the world of learning. If industry and schools are partners in setting the goals, they will be partners in finding the solutions.

- Knowing how and what young people think about industry is a pre-requisite for determining future actions, both for schools and for companies.

- School/industry partnership agreements need to recognise the value of increased autonomy for individual schools and training institutes, within clear national frameworks governing curricula and qualifications. Such autonomy enables schools/colleges to adapt courses better to regional requirements in consultation with industry, to respond more quickly to changing needs, and to develop joint projects or courses which utilise local industry-based resources for teaching/learning.

- The key issues to which school/industry links should be addressed are:
  - *strengthening vocational/technical elements in the curriculum*
  - *developing the teaching of new technologies*
  - *improving teaching methods and links with guidance*
  - *increasing integration of education and training in the workplace and working life*
  - *developing patterns of continuing education and training*

3. Encouraging the pursuit of scientific and technical careers

In all Member States, the most important capital resource are the men and women in the workforce, and better training for all of them and for those about to enter the labour market, is an essential investment. Industrialists in some Member States are concerned over their continuing failure to attract young people into industrial careers and need to examine why their image is so low. The consistent under-representation of women in industry and technology is a disadvantage to both industry and women.

IRDAC considers that a major objective of school/industry partnership should be to **encourage the pursuit of scientific and technical careers by young women and men** and makes the following recommendations:

- Increased flexibility and articulation is required in education and training, as well as the provision and right of access to continuing education and training.

- Since, for some companies, school/industry links are part of the firm's recruitment and public relations policies, it could be helpful for teachers to participate in the planning and implementation of these policies.

- The links between general education and vocational training need to be made as flexible as possible, allowing students to change from one branch to another. Certificates and diplomas obtained in the vocational field should be recognised as valid entry requirements for secondary and/or higher education.

In order to achieve these objectives, IRDAC recommends to the Commission the implementation of a set of very practical actions:

1. **Actions to Focus on Teacher Awareness and Training**

2. **Actions on the Interface between Schools and Industry**

3. **Actions to Get in touch with Young People**

These actions are summarised below.

1. Actions to Focus on Teacher Awareness and Training

- *Design pilot initiatives to involve careers guidance teachers in the selection and recruitment activities of industrial firms and to encourage joint training for educational and industrial managers on aspects of management development*

- *Investigate, across Europe, the circumstances in which teachers work and their freedom/capacity to innovate and the freedom/capacity to participate in school/industry links*

- *Develop well structured transnational vocational exchanges for trainees and trainers.*

- *Analyse the possibilities for teachers to gain a minimum of one year's experience in industry, business, or commerce before they complete their final qualification*

2. Actions on the Interface between Schools and Industry

- *Develop criteria and evaluation strategies for school/industry links*

- *Draw up a European Bulletin on legislation, agreements and practices which encourage or inhibit school/industry links*

- *Organise an annual European competition for the Best School/Industry scheme of the Year*

- *Publish a bulletin of good practice in school/industry incentives throughout Europe, including examples of regional sponsorship of schools by industry and fiscal incentives for co-operation by firms*

3. Actions to Get in touch with Young People

- *Encourage local and national surveys of young people's attitudes and images of industry and their views on school/industry links and comparing them with those of their parents and their teachers*

- *Investigate the motivations and mechanisms through which young people choose their careers in the area of technological studies*

- *Evaluate the initiatives in different Member States to attract girls and women to careers in industry and report on their success in the national context. Also to look at the effectiveness of such campaigns in increasing industry's acceptance of women*

- *Produce a checklist for publishers of school textbooks for the way in which industry is presented and to use industrial examples where appropriate*

Section 1 : Introduction

1.1. IRDAC Working Party 11 on education and training

IRDAC, the Industrial Research & Development Advisory Committee of the European Community, established in 1989 a Working Party (WP 11) on education and training issues relevant to industry, in particular those related to the competitiveness of industry[1] across the European Community. IRDAC had recognised that European scientific and technological Research and Development programmes could not be considered in isolation from the issue of adequacy of both the numbers and the skills and qualifications of scientists, engineers and technicians : skills that are needed to carry out innovative scientific research and to apply the fruits of the research to develop European industry's competitiveness in the face of the existing and growing challenges of the rest of the world.

There was evidence that higher investment in scientific and technological R & D - a crucial area in which Europe must keep and improve its competitive position - might fail to produce the expected economic benefits due to a lack of qualified people both to develop and exploit advanced and innovative products and processes. This concern of IRDAC, fostered by growing current and anticipated skills shortages, was echoed by DG XII, DG XIII and the TFHR[2] of the Commission of the European Communities who supported the formation and activity of the Working Party. The following terms of reference were agreed by IRDAC and WP 11 following discussion between the Chairman of WP 11 and officials of DG XII, DG XIII and TFHR :

> *"Advise on questions related to the implementation of actions on or affecting European education and training.*
>
> *Specifically, to recommend measures aimed at :*
>
> 1. *Promoting increased industrial awareness, participation and action;*
> 2. *Reinforcing links between university and industry;*
> 3. *Promoting school-industry cooperation;*
> 4. *Encouraging a coherent relationship between activities in the education and training field, and related Community R & D;*
> 5. *Identifying skills shortages and measures to redress them, in particular in priority sectors in relation to Community policies;*
> 6. *Promoting the development and transfer of skills to disadvantaged regions and industrial sectors;*
> 7. *Promoting the development and recognition of continuing education and training on a European basis;*
> 8. *Ensuring the timely dissemination and utilisation of the outputs of actions, including appropriate mechanisms.*
>
> *The Working Party shall operate through a work programme and submit an annual report to IRDAC. It shall work closely with the Commission services concerned (including TFHR, DG XII and DG XIII)."*

The terms of reference were broad, leaving it to the Working Party to decide on its specific work programme and mode of operation.

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1 In this report, "industry" includes all sectors of industry, both services and manufacturing. Manufacturing comprises also production, construction and process industry.

2 TFHR stands for "Task Force Human Resources, Education, Training and Youth".

Following two meetings of WP 11 it was clear that there was no lack of important issues needing study. Despite much of the ground having already been trodden (the Working Party noted in particular the report by The Round Table of European Industrialists "Education for Life - A European Strategy"), it was considered that across Europe there was still inadequate realisation by all parties - Industry, Education and Governments - of the massive efforts required in the fields of both initial and continuing education and training to ensure that industry's forward manpower needs could be met.

From these two meetings two inter-related themes were chosen for study and two sub-groups were set up to work in parallel. The two subjects were : "Skills Shortages" and "Schools and Industry".

- ***Skills shortages***

  There was much current evidence that serious skills shortages were already growing at a time of relatively high unemployment; shortages, particularly of scientists, engineers, technologists and technicians were apparent in the key generic technologies : Electronics and Information Technology, Systems Engineering, Telecommunications, Biotechnology and Advanced Materials. In these areas the necessary transfer and diffusion of technology into all sectors of the economy, including mature and traditional industries and agriculture, clearly demands increased numbers of skilled manpower, many with new and multi-disciplinary skills. At the same time there was little evidence that on the one hand, education systems were changing fast enough to match the rapidly changing labour market driven by the accelerating pace of technological change and on the other hand that industry was taking adequate steps to update the skills of the existing workforce through continuing education and training programmes.

  It was apparent that information on future skills needs, and on current and anticipated skills shortages was lacking particularly on a European scale and on a coherent and consistent basis. Skills Shortages was therefore considered a vital area for study and report as was also the second related subject : Schools and Industry.

- ***Schools and Industry***

  There was strong industrial backing for the view that the clear forward need for more scientists, engineers and technicians was unlikely to be met unless across Europe there were more students, (not least females), appropriately educated at compulsory school level in science, mathematics and technology, subsequently to enter studies leading to technical qualifications at all levels. At the present time the attraction to young people of science and engineering, let alone a career in industry, is not adequate to meet the perceived needs of the European Community.

  In the higher education sector in most Member States there was growing and fruitful industrial academic collaboration in many forms, a development as yet generally unmatched at the primary and secondary school level. It was felt therefore that development of such links would be an important area of study.

Both groups have drawn conclusions from their studies and have made both general and specific recommendations for action. These are complex and developing issues and industry, education, government and individuals are all involved. Some recommendations are specifically addressed to the Commission which can act as a catalyst to promote wider action, notably in areas of creating awareness of issues with a European dimension and in initiating European studies and research where adequate information and coordinated data gathering is lacking.

IRDAC above all is convinced that education and training issues related to industrial competence and competitiveness have an overriding importance in relation to the future well-being of Europe and its citizens and merit a thrust and a degree of co-ordination at least equal to that given to the Framework programme for Research and Development.

1.2. IRDAC's approach to the school-industry issue

The subgroup of IRDAC Working Party 11 which dealt with the Schools-Industry Interface summarised its purpose and overall view of the School/Industry Interface in the following paragraph:

> ***"Industry needs skilled and scientifically literate people. Schools lay the foundations for attitudes and skills in adult living and working. No young European should leave school scientifically and technologically illiterate. Any actions to prevent or remedy skills shortages in the labour force must filter down to the schools. An important strategy in this is the development of the school/industry interface, particularly through the development of different forms of partnerships."***

Carrying out its work between January - June 1990, the subgroup adopted the following terms of reference:

- Examine the growth of school/industry partnership in the European Community and comment on its direction.
- Advise on issues relating to industry's participation in education and training in schools.
- Identify positive actions in school/industry partnerships and make recommendations for their acceptance by industry.
- Advise, taking account of existing Community Action Programmes and studies concerned with school/industry partnership, on ways of promoting the spread of school/industry partnership schemes and encouraging innovation in school/industry alliance.

Educationalists would no more tell industrialists how to run their companies than industrialists tell educationalists how to manage the education system, but the views from both can be of value and should certainly be listened to.

In this report industrialists comment on how they see education and training and offer their opinions to education and training policy-makers and managers. IRDAC, the Industrial Research and Development Advisory Committee, hopes its views will be of value in furthering Community development of education and training policies, with the aim of developing the full potential of Europe's most valuable resource - its people - and thereby raising the competitiveness of European Industry.

Section 2 : DIAGNOSING THE SITUATION

2.1. Background

Industry

Industry has been described as "the application of scientific principles and available technology to add value to raw materials, component parts and information thereby producing goods which people need to enhance the quality of lives and the wealth of the country". To do this work, industry needs skilled and scientifically literate people at all levels, from scientists and innovators, to technical, craft and maintenance workers.

The situation vis-a-vis skill shortages throughout the Community and in relation to Europe's major competitors is set out in the report on skills shortages. Some of the important observations made in that report and of relevance here are:

- ***One of the biggest challenges facing European education and training systems is to raise the status and attract more able students to technical education at compulsory school level;***

- ***Technological skills shortages are not only of concern related to the level of engineers and scientists. To tackle the fundamental problem of skill shortages, no person should leave compulsory schooling without qualifications and skills and a basic understanding of technology.***

- ***In order to make more accurate predictions about skills shortages, a serious standardization effort in the collection of data relevant to skills shortages, its classifications and the projections on which it is based, is urgently required.***

- ***If no corrective actions are taken, Europe will be faced with increasing gaps in important, technical skills.***

Education and training has always been seen as the thread that gives form to the fabric of society, the transfer of values, tradition and culture and the breeding ground for social and scientific progress. The goal of individual development sits alongside, sometimes uncomfortably, society's goals of cohesion and progress. In a world where the pace of change is accelerating, there is increasing recognition that schooling and educational attainment of the labour force is a significant factor in labour market flexibility and structural adjustment.

Industry's requirement of education systems is to ensure a supply of suitably educated young people, a supply which remains steady despite changing circumstances, such as declining numbers of young people, or negative attitudes towards working in industry.

> *"....(to assume that) industry in Germany can fill its engineering vacancies at present and that no drastic shortages are anticipated for the immediate future. On the other hand we must not lose sight of the general, albeit undramatic drop in the number of graduates in the nineties. To satisfy long term needs, we must make sure now that the overall number of students entering engineering faculties remains constant. This means, however, that the overall proportion of engineering students will have to go on rising in future and that we must already start drawing the attention of the public to this development and take appropriate steps in advertising for the engineering profession" . (SIEMENS)*

While the reports of both sub-groups deal with a much broader canvas of technical skills than engineering skills, IRDAC wishes to stress the importance of engineering skills within the skills

shortage debate, and the breadth of activity covered by the term "engineering". What is understood by the term "engineer" differs from one Member State to another. In the UK, the term engineer refers to a range of people employed in the engineering profession regardless of formal qualification, while in other Member States, for example the Federal Republic of Germany, France and Italy, the title of "engineer" refers to those who have obtained a degree in engineering at a higher educational institutions, regardless of whether they occupy a technical position. Most countries have two levels of engineering education (France and Italy being the main exceptions), one at universities or equivalent institutions, with courses of four or five years duration (six in Spain and often only three in the UK) the other of a more practical vocational nature lasting three to four years, sometimes incorporating long student placements in industry. Throughout industry as whole, the term "engineering" is being used to describe an increasingly broad range of activities. In some Member States, architecture, information technology and computer science are classed as engineering and the terms "knowledge engineer" and "software engineer" have now entered the industrial language.

Schools

Young people have a need for and claim a right to high quality basic education and initial vocational training leading to recognised qualifications. A broad basic school education has become more necessary than ever and the requirements of the future labour market favour broad education for all, rather than for an elite. Some fear that breadth can only be obtained at the expense of excellence. Excellence must not be equated simply with early (or lengthy) specialisation. The broader the provision of general education, the wider the scope for young people to make their own decisions and to pursue their own paths of excellence. The narrower the education on offer, the more difficult it is for young people to develop their full potential. And breadth in education is not merely a question of the number of subjects on offer, it is also to do with the breadth of experience provided within each subject, experiences such as:

- the opportunity to acquire further education
- development of initiative
- development of an enterprising spirit
- better preparation for training in technical fields
- learning at least one other Community language
- combining training and experience in the labour world
- comprehensive general and civic education
- ability to carry out project work involving design, planning and problem- solving

Of particular concern to IRDAC are those experiences and opportunities within compulsory schooling which introduce young people to the world of work in general and those which increase the status of technical subjects by the time young people are making subject and career choices.

Schools and Industry

Since industry directly selects its recruits from universities and technical training institutes and, in some countries, is directly involved in training provision at post-compulsory level, it naturally has some measure of control and influence over the quality and quantity of training. This report focuses on a new kind of relationship, the partnership between schools in compulsory education and industry. The schools/industry interface is an arena for co-operation at a practical level on schemes and initiatives which link the world of work to the world of learning.

To many, industry seems to be the more active partner in this relationship and often its desire for involvement with the education of young people is viewed with suspicion. Images of factoryline production of young people according to industry's wants and needs regardless of any social and spiritual values spring readily to mind, but it is as well to remember that education systems themselves are sometimes seen as "processing factories" of young people rather than agencies of growth and development. Industry does want some measure of control over what goes on in schools;

it will be employing some of the output, but it wants to do that in a spirit of co-operation, liaison, responsibility and trust.

Within the context of the Single European market and working towards the social and economic cohesion of the Community it is recognised that there is a need to support Member State policies to improve training provision which forms part of secondary (i.e. compulsory) education and apprenticeship systems. A substantial period of initial training leading to a recognised qualification is the crucial precondition for the transition of young people from school into their working lives. ***In all Member States, the most important capital resource are the men and women in the workforce, and better training for all of them and for those about to enter the labour market, is an essential investment. Raising the quality, status and attractiveness of technical/vocational education and fostering key competences (creativity, independence, teamwork skills, communication) of young people in it must be seen as priorities, in order to face the challenge of industrial and technological change in the Community and the competition to which its economies are exposed. Partnership between schools and industry is as valuable to education as it is to industry.***

Mutual gain is a good basis for equal partnership.

2.2. Industrial Employment and the Skills Market

The Changing Situation

There are four major issues affecting industrial employment and related industries at the present time:

- **the demands of technology** - requiring continuous restructuring and retraining of the workforce
- **increasing competition for a wide range of technical and engineering skills** - from other sectors of the economy
- **the development of business on a Europe and worldwide basis** - placing different kinds of demands on training needs
- **the declining number of young people in the population**

The success of a company depends largely on the knowledge and skills of its employees. In an age of rapid technological change, scientists, engineers and technicians become more significant in the development and implementation of new processes and products.

The question whether there will be enough scientifically and technically trained recruits of the right quality available on the job market in the short, medium and long term is a matter of great importance to companies. This problem affects all countries, but responses and strategies to deal with the problem vary from country to country.

> *In some Member States, such as the Federal Republic of Germany, industry is a full and controlling partner in the training process, with all the rights and responsibilities that implies. Germany has well-established structures through which representatives of industry and higher education regularly discuss matters of common concern and, if necessary, work out proposals for change. This practice of education/industry co-operation filters down to the schools in the form of "Arbeitslehre", a school subject aimed at providing pupils with a basic understanding of the economy and helping them to make an informed career decision.*
>
> *In other countries, such as Spain, France, Italy and Greece, there is no tradition of industry involvement, although, for example, the Spanish Constitution of 1978 allows for the participation of the social partners and industry in the administration of education and training.*

The European Perspective

The dominant influence on initial and adult training policy for the 1990s and beyond will be the need to adapt it to meet the rapidly changing requirements of industry. All Member States are having to

address the training implications of industrial change. Change not only in organisation and location, but also in its manpower levels and skill requirements.

Education and initial vocational training policies are concerned, among other things, with managing the supply side of the skills market. The demand for skilled employees is expressed in terms of occupations rather than educational or vocational qualifications. This makes matching supply with demand and the forecasting of skills demands difficult. Policies must be designed so that a balanced output is achieved in relation to the needs of the skills market. Too many graduates and not enough technicians, too few people with science backgrounds create imbalances in the skills market which are difficult to correct and which, in turn, have their own consequences. A shortage of people with technician level skills leads employers to turn to graduates to fill those posts, causing deflation in qualifications. As the companion Skills Shortage report points out, "it is generally much more difficult to replace technical by non-technical staff than vice-versa" (para. 2.4)

Different skills at different levels

Over the last ten years, manufacturing employment has been declining in most European countries; large manufacturing companies can achieve greater output with fewer in the workforce. However, declining numerical opportunities in manufacturing are accompanied by increasing requirements for higher levels of skills throughout the industry as a whole. So, manufacturing industry may need fewer people, but if fewer people are required to operate an increasingly sophisticated and technologically advanced industry, those people need to be quality professionals. Most of the decline in employment in manufacturing has been compensated by a rise in the services sector, which seems to be starting to experience similar problems.

Occupational profiles have shifted dramatically in recent years. SIEMENS in Germany reports

> *"a drastic change in the structure of the workforce, where there is a constant decrease in the number of semi-skilled and unskilled workers, with a corresponding increase in the number of more highly educated technical staff; top qualified engineers have more than doubled their share of the Siemens workforce from 9.6% in 1970, 18.5% in 1987 and 20% in 1989. The UK engineering industry, despite an overall decline in employment of 36% , is witnessing a 61% increase in the employment of professional engineers, scientists and technologists.*

Connecting Education to the Labour Market

Exactly how educational attainment affects a nation's economic activity and social welfare however is a matter for debate and gives rise to a plethora of theories. Whether these theories explain some or all of the situation, it is clear that 'human resources' and education and training policies are an important factor in economic performance. The existence of skill shortages points to qualitative mismatches between labour supply and demand. A well educated and trained labour force is crucial to the process of adjustment to economic change and to the competitiveness at individual, company and national economy level.

The Skills Shortage report points to a cause for concern over the educational output of the EC, especially in the area of third level technical, vocational and university education, in comparison to Japan and the USA. Even more disturbing to the European Single Market are the considerable differences within the EC, in the skills balance between technical, vocational and university graduates.

The creation of the Unified Internal Market itself will lead to further restructuring, at national and international level and demand new and different skills. The Common European Market, will for example, need scientists and technicians who can think and act European. Companies which operate worldwide require and already have in their ranks staff who think internationally, who are mobile and willing to operate in different cultures and who are capable of fostering international contacts while

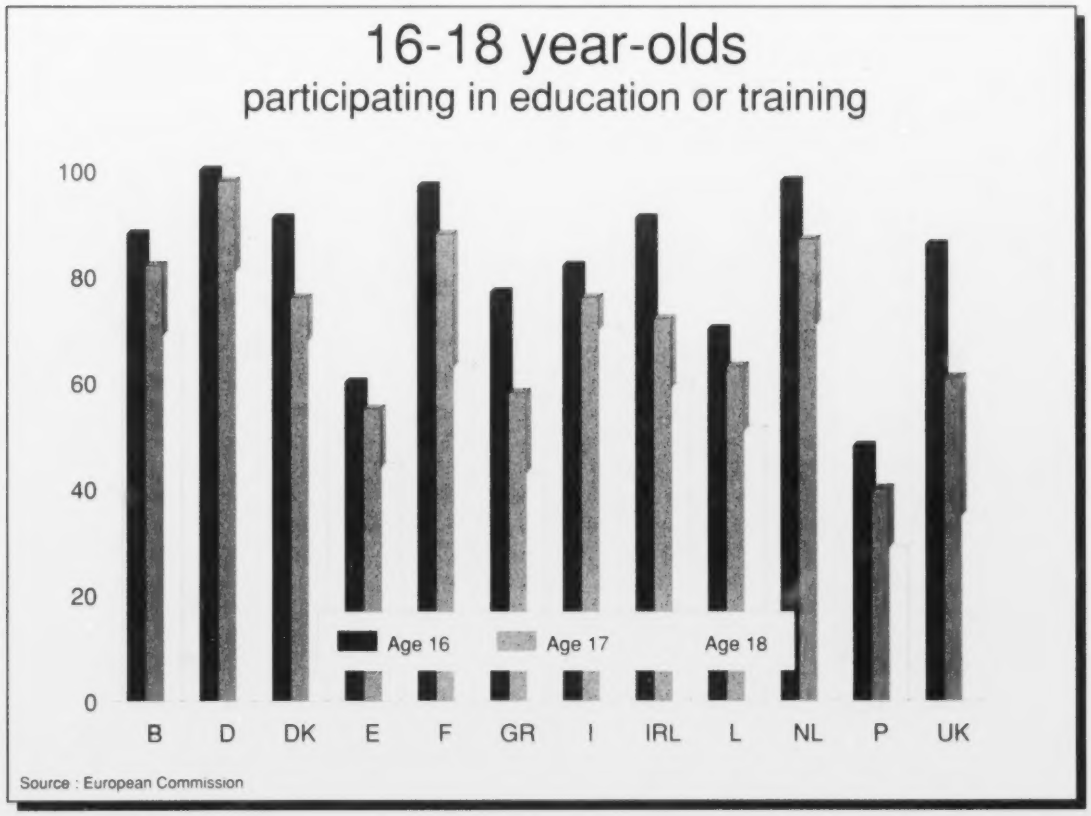
maintaining a corporate identity. The need for such European-minded technologists will increase greatly from 1992 especially in small and medium size companies and their recruitment will become an increasingly important part of personnel policy.

2.3. Young People - Changes and Choices

In Europe, young people will be in short supply for three decades to come. For every 100 15-19 year olds in 1990, there will be 88 in 1995 and 84 in the year 2000. Population projections into the next century show a stabilisation in the first decade and then a continuation of the decline. All Member States are affected, even Spain, Greece and Ireland, which had, until recently, stable or growing numbers of young people. The availability of young people aged 15-19 will have reduced by approximately 25% between 1984 and 1995.

Different patterns of education and training/staying on rates

When young people come onto the labour market and with what kind of educational background are also factors relevant to the supply question. Recent data compiled by the Commission in the framework of the PETRA programme indicate great disparities between the Member States in the proportion of young people staying on in general education or training after completion of full time compulsory schooling. As shown in the next graph, over half the Member States retain their 16 years olds, but some, Spain and Portugal included, retain only 50-60%.



Of 17 year olds, a few countries retain 80% or more, and the Federal Republic, over 90%. Other

Member States, including the United Kingdom and Greece retain between 40-60%. At 18 years of age, the disparities are even greater. Four out of five young people are still at school or in training in the Federal Republic, three out of five in Belgium, Denmark, France, the Netherlands and Ireland, and less than two out of five in Portugal and the United Kingdom. Data from the OECD shows that staying on rates are highest in Japan, where 98% of young people stay on in formal education until 18 years of age.

Choices made by young people

The factors influencing study and career choices of pupils are wide and varied, ranging

- from **personal factors:** motivation; aspiration; personal likes and dislikes, experiences and prejudice;
- through **social factors:** social class; gender; ethnic origin; family influence;
- and **practical considerations:** financial pressure to work; money available for study or training; existing family connections with certain careers;

and include intellectual and practical aptitudes.

Choice-making is a continuous process, although it sometimes appears as though there are "choice points" or "moments of decision". In fact the choices were made some time previously and these points represent a commitment to a course of action or certain route. Guidance and counselling strategies which intervene at these points are frequently too late to influence action.

The word "choice" may also be a misnomer. What is available, either as further education or training provision or employment, is often the "choice". A number of studies have pointed to the fact that, if young people are asked to "choose" a vocational track (i.e the general occupational area in which they would like to work) or subjects with a view to future career path, at the age of 13 or 14, their choices will be often based on their parents' demands, or on subjective feelings often conditioned by social or gender role. Girls continue to "choose" not to enter technical and engineering fields, much to the detriment of industry.

In some Member States, the number of females entering technical and vocational education is increasing, but not diversifying. In Greece out of every 100 females, 37 are in business courses, 23 in health and social welfare and 22 in technology based courses. Special campaigns in a number of Member States, to encourage girls into scientific and technical fields, have had an effect in increasing female participation in these areas, though girls are still under-represented in science subjects during their fourth and fifth years at school.

The sex stereotyping evident in the subject choices of boys and girls at secondary school level continues in further and higher education. In the UK women comprised 9% of full-time tertiary students of engineering and technology. More significantly, the gap between male and female university students is greater for applied science subjects (1985/6: male 34,000; female 5,000) than for pure science (male 41,000; female 24,000).

And the effect of these "choices" can be seen in the labour market. A UK study of the destination of 1st degree students 1985/6 showed that over half (male 58.7%, female 54.1%) first degree students went into permanent employment. The areas they chose are displayed in the next table.

Employment area	Women (%)	Men (%)
Public service	29.7	19.0
Education	11.0	4.0
Manufacturing Industry	18.2	41.3
Commerce	31.1	27.3

It is also through the process of "choice" that negative images of certain types of employment or certain industries plays a significant role in young peoples' "choices". Lacking actual information about a job, people rely on stereotypes, e.g. banking is boring, the civil service is secure, manufacturing industry is dirty, financial and legal services are glamorous.

Teachers' own stereotypes also play a role in students' subject choices:

- the personal relationship between teachers and pupils (like/dislike of a teacher and his/her subject);
- the teacher's attitude towards general and specific social questions;
- the way in which a subject is taught and the pleasure the teacher gets from teaching it and the student gets from learning it;
- the pursuit by committed teachers of their own interests with students.

The Right to Information

The main factor influencing study and career choices should be INFORMATION, but it rarely is. Young people should be asking the following kinds of questions (and taught to ask these questions) and industry, the guidance services and the media should be providing the answers. School/industry links are a vehicle for finding out the answers:

- What is the job environment?
- What rewards does the job provide? (high salary, convenient hours, pleasant surroundings, emotional satisfaction, adventure...?)
- Why would this job be satisfying? (for this, you need to know who you are and what you want)
- How much training or education is required? Where could you get it?
- Are there any physical limitations for this job?
- What is the approximate starting salary? Mid-career salary?
- What is the projected outlook for this occupation? Will there be many jobs available when you are ready to enter the labour market? Or are there few openings with much competition?
- What aptitudes, strengths and talents are required?
- How can you begin today to prepare for this career?
- What subjects do you need to take at school to pursue this career?

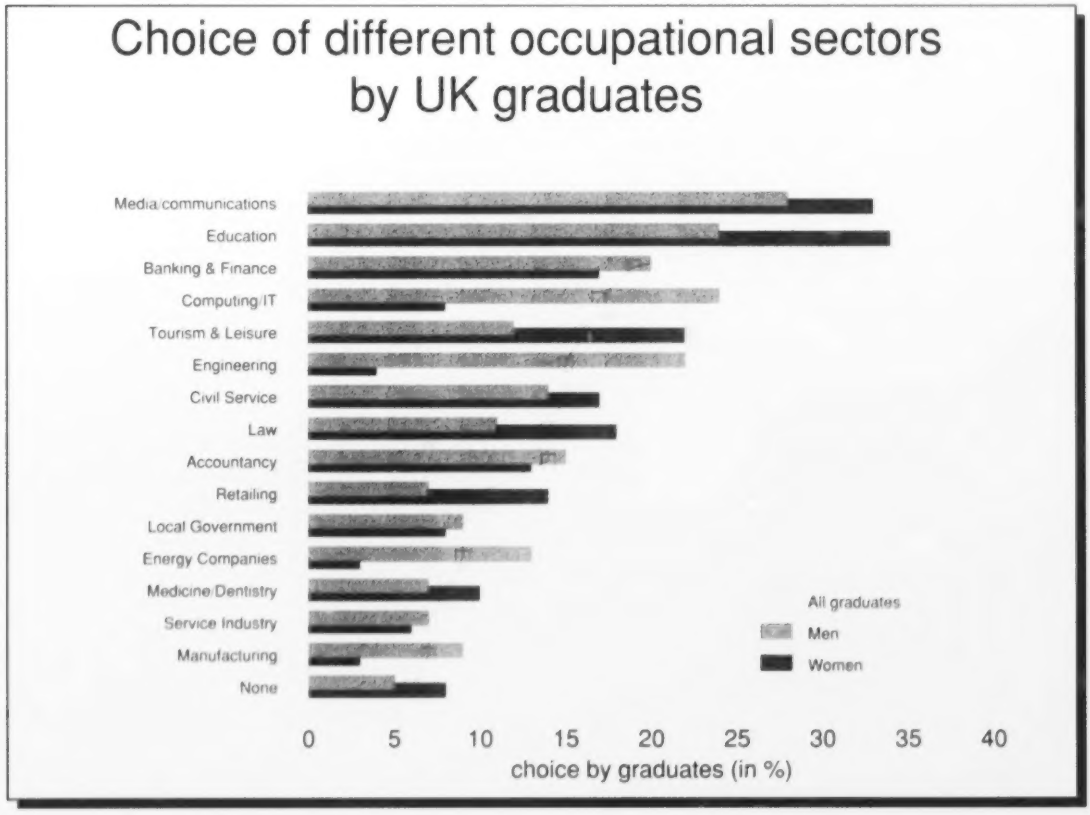
2.4. Meeting Industry's Needs

Increased Competition

Industry now finds itself competing along with other sectors of the economy for the most skilled and qualified people at managerial, scientific, technical, craft, administration and operations level. Different firms across different sectors of manufacturing and production may be looking for different profiles of young person (graduate, science graduate, technical engineer background, apprentice level) but all are in competition for the best. In the UK, for example, manufacturing is fighting a rearguard action against the prestige and salaries offered in marketing or financial services; small companies are in competition with large multi-nationals to attract graduate recruits.

At a time when the pool of young talent is smaller than it has ever been because of demographic factors, image becomes a crucial factor in gaining a competitive edge. The neglect of manufacturing industry, under-investment and cultural attitudes which give higher status to the provision of services rather than the production of goods combine to create negative images. Larger, prestigious companies can afford the time and the resources to change these images through publicity, support of school/industry initiatives, involvement in education and curriculum development and provision of work experience/taster courses for interested young recruits; it is the smaller manufacturing companies which suffer.

This is illustrated by a recent survey carried out by The Financial Times (14.7.89), as shown in the next figure :



Forecasting Industry's Needs

Demographic changes make the supply of new labour a seller's market (the young person's) rather than the buyer's (the employer's). While this might seem a just reversal of roles in which young people are in a better position to negotiate conditions, income and prospects, it may have a negative distorting effect on their career, education and training decisions. The increased competition between employers to recruit high quality entrants may lead, in some regions, to earlier recruitment of young people into employment, rather than entering training, particularly where training is not highly regarded, or of good quality. There will be a greater urgency to ensure that all young people receive training and to increase retention rates, in order to increase the proportion entering the labour market.

One way in which some countries have tried to avoid these distorting effects is by taking pre-emptive, rather than reactive, action. While forecasting does not guarantee control over the situation, accurate forecasting of industry's needs, comparable at a European level, would help to anticipate problem areas and plan necessary responses. In the UK, the Engineering Industry Training Board has deployed levy money on a range of initiatives aimed at tackling both national and local problems on behalf of the engineering industry. The 1989/90 budget contains a programme of initiatives costing over two million ecu, a large part of which is used for 'supply side' initiatives designed to increase the supply or stock of key personnel within the industry. These include a range of initiatives designed to attract more women into industry.

Ensuring the right level of supply to industry is not simply a matter of numbers. Ensuring the right balance of technicians, operators, engineers, researchers, designers and innovators is also important, but balance cannot be achieved through rigid management of initial education and training. The answer lies in increased flexibility and articulation in education and training, as well as the provision of, and right of access to, continuing education and training.

The status gap between general (academic) education and vocational education does little to aid this process. General secondary schools tend to be better equipped and staffed than vocational schools. This makes vocational schools less attractive to young people and is one reason why courses at these schools are branded as second class.

Schools play a crucial role in developing positive attitudes and confidence towards learning so that education and training becomes a way of life and not a necessary, but uncomfortable rite of passage. All need to be open to the idea of continuing training, even the academic "high-flyer". Even academically able young people will find themselves with redundant skills if they believe that what they learned in their initial studies will suffice throughout their working lives.

It will not. Not in the 21st century.

2.5. School/Industry Interface

IRDAC has considered examples of good practice in school/industry links and has consulted with experts in the field. The time available to gather evidence of good practice from all Member States was limited and, for this reason, examples from Spain, Italy, the Federal Republic of Germany and the UK only are presented in the Annexes. The European perspective is provided in Annex 1 through an overview of the European Commission Programme on the vocational training of young people and their preparation for adult and working life.

IRDAC welcomes the fact that the Commission's own policies in this area reflect growing recognition of the fundamental and long term contribution to European integration which must be played by the education and training systems. Such integration is no longer seen exclusively as a matter of economic or monetary policy. It is through economic and social policy together, including preparing young people for greater mobility and helping equip them with new types of qualification, that European citizenship will be constructed.

In presenting selected evidence for good practice in the field of school/industry links, the Sub-group would like to commend the output of the Commission's Action Programmes on the Transition of Young People from School to Adult and Working Life, in particular, the importance of closer links between industry and schools of all kinds, for young people's preparation to enter the world of work, for the development of a well-informed understanding of industry on the part of teachers and pupils alike and for their familiarisation with current practice in technical education and training.

At Community level, the spread of school/industry partnership schemes should be seen as one way to reinforce the Community's current policies :

- to obtain a better trained workforce;
- to provide a basis for helping the "backwardness of the least favoured regions";
- to help tackle unemployment, especially among young people;
- to help business adjust to the changes consequent on the completion of the Internal Market;
- to help the development of rural areas, and
- to promote equality of opportunities in training and employment for women.

However, there is a wide variation in national policies and practice in education and training which affects the quantity, quality and range of skills entering the labour force, which, in turn, affects national economic activity. Some of this variation can be traced to key differences between national systems of education:

- Differences between Member States in the statutory minimum age for leaving full-time school and wide variations in the proportion of young people staying on in (general) education or training after completion of full time compulsory school are of considerable economic importance in the context of the Single Market. Countries with minimum leaving-ages under 16 face two problems. First, from those pupils who do not stay on and who arrive on the labour market inadequately prepared. Second, from those who stay on and enter training, but whose short period of compulsory schooling will not have been sufficient to provide the necessary broad general education needed as the foundation for vocational training of quality.

- The connection between the basic education system and vocational training differs between countries depending on where vocational training is mainly located - in the education and training system (schools and colleges), or the employment system (firms and companies). A further blurring of responsibility results from which central government department is responsible for vocational education.

- The social and economic status of a young person in training varies according to the type of training and the system of provision, so that a young person may be treated as a student, a trainee or an employee, and may be receiving a training allowance or a salary, or nothing at all. Status also varies with the prestige and value accorded to different types of post compulsory education and training. In France, the academic stream or route is the strongly preferred choice of young people and dominates the initial training system. In Germany, the "dualsystem" is highly regarded as an access to the labour market.

- A recent Commission report, "The Leading Edge" reviewing the major trends and developments in industry's involvement with the school systems of the Member States of the European Community in 1988 shows a picture of disparity in co-operation between schools and industry. The most striking developments in northern Europe show how and at what level industry is increasingly co-operating with schools providing general education. In other parts of Europe, firms are just beginning to develop ways of supporting technical and vocational training and there is practically no involvement with compulsory or general education.

Both education and employment systems are interdependent and have been conditioned by, and adapted to, the culture and history of each nation. Many of the problems associated with linkages between education and employment cut across national boundaries, but the solutions have always been sought - and found - separately by each country. National pride in a healthy manufacturing base goes a long way to convincing young people that they would like to work in industry, but the school curriculum must also bear some relevance to the industrial world and reflect its values.

School/Industry Co-operation

Industry has a variety of reasons for becoming involved in school/industry links

- Improving the general image of industry, particularly for the more able students, but for the country as a whole. This is relevant to those Member States where the liberal professions and the civil service are seen as the most prestigious career paths.
- Improving the image of careers in industry.
- Improving the image of the individual firms' specialist careers involving maths, science, technology, computer and business studies.
- Improving the quality of the specialist subjects in schools through teacher training and curriculum development.
- Encouraging education to:
  - interest more students in 'specialist' subjects;
  - ensure supply of trained teachers in 'specialist' subjects;
  - improve the quality of education to raise the educational level of the lower ability range to the standard required by industry;
- Improving the local image of the firm, particularly for foreign subsidiaries
- Doing something for the workforce whose children are in the schools.
- Recruitment of new labour.
- Personal development of staff from industry through involvement in an educational establishment
- Using the expertise of teachers seconded to industry to question a firms' education and training policy and practice.
- Keeping the name of the firm in the public eye
- A social conscience
- Interest in education and a belief in its importance by senior management
- Satisfaction for those working in industry from contact with young people.

There is no doubt that School/Industry links are equally important for schools. Partnership with industry provides schools with opportunities to enrich the curriculum and raise its quality; influencing the design of the curriculum and its relevance to working life; secondment of teachers to industry; financial sponsorship for innovative programmes, materials or equipment; creating work experience opportunities for young people; and the opportunity to work together, with local industry, towards common goals.

Through involvement with industry, teachers can be more aware of firms' recruitment policies (entry requirements, standards set, own testing etc) and the career structures and rewards they offer. It should be remembered that, for some companies, school/industry links are part of the firm's recruitment and public relations policies. It is legitimate for teachers to participate in the planning and implementation of these policies.

Managing and Monitoring the relationship between schools and industry

National, regional and local agreements are helpful in managing different forms of co-operation. At regional/local level, they bring together the general and technical/vocational sectors in order to promote coherence and continuity, while respecting the different roles the social partners can play.

Industry can co-operate with schools at local level in very practical ways, for example:

- *by sizing the need for all types of work experience/understanding*
- *by developing co-ordination systems and mechanisms*
- *by grading activities according to age*
  - *14 years olds : presentations by industry;*
  - *15 year olds : 'twilight' visits after school time*
  - *16 years olds : actual work experience.*

Lessons can also be drawn from experience in the USA, where school/industry links are formalised at Chief Executive and Governor level and where the goals are clearly defined and mutually agreed, for example:

- *for the US to be top of the league (industrially) by the year 2000*
- *to reduce dropout rate*
- *to ensure 90% graduation from technical courses.*

If industry and schools are both partners in setting the goals, they will be partners in finding the solutions.

In some countries, schools do not have the freedom to develop relationships with industry and the world outside the school. School/industry partnership agreements need to recognise the value of increased autonomy for individual schools and training institutes, within clear national frameworks governing curricula and qualifications. Such autonomy enables schools/colleges to adapt courses better to regional requirements in consultation with industry, to respond more quickly to changing needs, and to develop joint projects or courses which utilise local industry-based resources for teaching/learning.

Defining the roles and the responsibilities in the State/Industry/Schools Partnership

In general, compulsory-level education, the State has to be the policy-maker and provider, but industry should be consulted regarding the content of curricula and be willing to assist schools in implementing aspects of the curriculum and the process of educational and vocational guidance. In technical and vocational training, the State and industry should collaborate in all areas: structures, curriculum, skill requirements, certification and the provision of training.

Industry should play a supportive, but active role with regard to teacher training, both for general education and technical/vocational schools and colleges, for example through the provision of industrial experience opportunities by sectoral and regional industrial organisations and by firms and trade unions.

Evaluating different school/industry strategies is an important part of monitoring the relationship between schools and industry, but there is a paucity of information and documentation on evaluation procedures. What are the long term effects of school/industry links? On schools? On industry? Do they make a difference in young people's perceptions of industry and if so, in what direction? Do they make the school curriculum more responsive to the needs of industry?

Section 3 : IDENTIFYING THE ISSUES

The purpose of this section is to highlight the main issues which IRDAC considers to be of priority with regard to the school/industry interface. These are :

- *Challenges for Education and Training*
- *Getting in touch with young people*
- *A Question of Image*
- *Mobility between Education and Training Tracks*
- *The Status and Management of the Teaching Profession.*

3.1. Challenges for Education and Training

Responsibility for the development/improvement of the compulsory education systems rests with the public authorities, but industry and the social partners are significant social and economic forces and as such need to be consulted. Tripartite structures offer the most reliable means to ensure that co-operation between the social partners is carried out in a balanced way, with all partners being clear about their roles and responsibilities. European and national models of tripartite structures have been established in the vocational field and are available for examination.

Key areas for development are:

- strengthening vocational/technical elements in the curriculum (primary, secondary and post-compulsory vocational schools)
- developing the teaching of new technologies (primary, secondary and post-compulsory vocational schools)
- improving teaching methods and links with guidance (secondary and post-compulsory vocational schools)
- increasing integration of education and training in the workplace and working life (secondary and post-compulsory vocational schools)
- developing patterns of continuing education and training (post-compulsory vocational schools)

The need for a stronger and more consolidated Community approach to initial vocational/technical education and training is currently being considered and IRDAC notes that the Commission has undertaken in its 1990 Programme of Work to:

- rationalise and co-ordinate its Action Programmes on vocational and continuing education
- select additional priority areas, in line with requirements and with due regard to requests by Member States, for the deployment of the Structural Funds, to strengthen the concentration of effort and consistency in their implementation;

and stresses the importance of active involvement by the social partners in this process.

3.2. Getting in Touch with Young People

Young people are the clients of the education system. It is mainly parents and young people themselves who invest in education and training, who decide to go without certain consumer goods when they choose a longer course of training, or who, anxious for income, take a job with no training. The foundations for those decisions are laid at school.

Knowing how and what young people think about industry is a pre-requisite for determining future actions, both for schools and for companies. Market research needs to find out from young people:

- what do they think about industry?
- what have they been told about it?
- what schemes about industry have they like in their schools?
- what have they not like?
- what would they like to know about industry?
- what sort of activities concerning industry would they like to participate in?
- what have young people got to say to industry?

3.3. A Question of Image

Young people's image of industry plays a major role in their study and career decisions. Some countries in the European Community have more of a problem with a negative image of industry among the young than others. The higher the status of "manufacturing" and "engineering", the easier it is to attract recruits and to influence young people's study choices in that direction.

But industry in every Member State of the European Community shares a common image problem; the image of industry as perceived by girls and young women.

All Member States face a problem in attracting women into engineering; they are a large potential reserve which remains almost untapped. In the Federal Republic of Germany, although 48% of school leavers who are qualified to study are women, the proportion of women graduates in German universities in electrical engineering is 1.5% and in mechanical engineering 2.6%

Despite some improvement in some Member States, girls continue to "choose" not to enter industry, even if they are interested in scientific and technical subjects at school. Data from the Economic and Social Research Institute in Ireland demonstrates the problem:

> *"Even with the same educational qualifications in Maths and Science, girls are far less likely than boys to take applied science or engineering courses in Universities or Regional Training Colleges....Over half of the boys with two or more science subjects went on to do applied science or engineering courses in third level compared to less than one in four girls with equivalent qualifications.....In other words, even if girls take the same second level courses as boys and achieve the same level of honours in the Leaving Certificate, they do not then go on to take the same kind of third level courses, or enter the same kinds of jobs as boys."*

Two factors may be operating. One is a "push effect" from the schools:

> *"Teachers' expectations and support for girls' unconventional choices were independently influential in subject choice making".*

The second is the "pull effect" (or lack of it, at least as far as girls are concerned) from industry itself. Expected salary levels are an important factor in young people's careers choices. In a 1986 survey of earnings in Irish industry, 70% of women industrial workers earned less than ecu 420 per month, compared with 20% of men, painting a gloomy picture of the position of women in industry and one which is hardly likely to attract young women.

The consistent under-representation of women in industry and technology is a disadvantage to both industry and women, but mainly to industry. Industry needs to re-examine why its image is so low with girls and women.

3.4. Mobility between Education and Training Tracks

Vocational education and training must not become a dead end after which further education in other branches of the education system is no longer possible. The links between general education and vocational training need to be made as flexible as possible, allowing students to change from one branch to another. Certificates and diplomas obtained in the vocational field should be recognised as valid entry requirements for secondary and/or higher education. Equally, "humanistic" qualifications should not bar a young person from technical and scientific study. Conversion courses are one strategy for improving the mobility of young people between different education and training tracks, others include:

- avoiding early specialisation in the vocational schools/tracks
- equalising the status between vocational and general/academic education
- improving facilities, staffing and equipment in vocational education
- developing flexible accreditation systems
- furthering work on comparability and transparency of qualifications
- supporting strategies aimed at developing mutual trust between the different education and training tracks
- working towards mobility between education and training tracks in different Member States

3.5. The Status and Management of the Teaching Profession

A confident teaching profession is able to look beyond the confines of the classroom to the world beyond. Training is one of the keys to building confidence and the following elements need to be built into teacher training:

- industrial placements as part of initial teacher training
- short term work-experience for careers guidance teachers, vocational subject teachers, general subject teachers, head teachers.
- exchanges of staff between firms and schools
- joint training for industrial and education/training staff
- special schemes for primary school teachers

Better management of the teacher profession needs to include:

- ensuring enough teachers for a proper delivery of a balanced curriculum
- reviewing (on an ongoing basis) the teaching of mathematics and sciences - what kinds and at what levels
- allowing teachers the freedom to innovate and ensuring they have the capacity to do so
- reviewing teachers' industrial awareness and attitudes
- developing incentives for co-operation between teachers and industrialists

Teacher shortages in scientific and technical subjects pose particular problems, not least because it is often industry which attracts potential and practising teachers away from the teaching profession, through better salaries and better opportunities to pursue their technical skills and interests. Improved

conditions of service, salary incentives and more equality of status between different subjects would help. The Sub-group is of the opinion that allowing technical teachers in compulsory and post-compulsory schools to participate in industrial research and development would help teachers keep pace with developments in industry, as well as provide a mechanism for co-operation between schools and industry.

All teachers need to be conversant with the use of new technologies as teaching and learning tools. The Education Industry needs to keep pace with technological developments and their educational applications. For this, a considerable in-service training effort is needed so that teachers can raise their own level of technological literacy.

Section 4 : POLICY RECOMMENDATIONS AND PROPOSALS FOR ACTIONS

4.1. Main Objectives

Having considered the available evidence and sought the views of experts in school/industry links, IRDAC wishes to emphasise the importance of closer co-operation between industry and schools of all kinds as a means of achieving the following Objectives:

OBJECTIVE A. Raising the overall level of technological literacy

OBJECTIVE B. Preparing for and understanding of the world of work

OBJECTIVE C. Encouraging the pursuit of scientific and technical careers by young women and men.

4.2. Policy Recommendations

To achieve the above Objectives, IRDAC makes the following Policy Recommendations:

OBJECTIVE A: RAISING THE OVERALL LEVEL OF TECHNOLOGICAL LITERACY

- One of the biggest challenges facing European education and training systems is to raise the status of technical education at compulsory school level, and in addition to ensure that no person should leave compulsory schooling without a basic understanding of technology. (Section Two, para.1.1)

- Education and initial vocational training policies should be designed and constantly adjusted so that the skills output of the education and training systems are in balance with the needs of the skills market. (Section Two, para.2.6)

- The broader the provision of, and experiences within, general education, the wider the scope for young people to make their own decisions and pursue their own paths of excellence. The narrower the education on offer, the more difficult it is for young people to develop their full potential. A project approach, which involves design and problem solving, is an important component of a broad education. (Section Two, para.1.2)

- As a partner in the education and training process, industry should be consulted:
  - at compulsory school level on the content of curricula and be willing to assist schools in implementing aspects of the curriculum and the process of educational and vocational guidance.
  - in technical and vocational training, with a view to closer collaboration on structures, curriculum, skill requirements, certification and the provision of training. (Section Two, para 5.9)

- Industry should play a supportive, but active role with regard to teacher training, both for general education and technical/vocational schools and colleges, for example through the provision of industrial experience opportunities by sectoral and regional industrial organisations and by firms and trade unions, or by involvement of technical teachers in industrial research and development. (Section Two, para. 5.9)

OBJECTIVE B: PREPARING FOR AND UNDERSTANDING OF THE WORLD OF WORK

- A substantial period of initial training leading to a recognised qualification and a school curriculum which bears some relevance to the industrial world and reflects its values, are essential for young people to move successfully from school into their working lives. (Section Two, para 1.3)

- The schools/industry interface should be an arena for co-operation at a practical level on schemes and initiatives which link the world of work to the world of learning. If industry and schools are partners in setting the goals, they will be partners in finding the solutions. (Section Two, paras. 1.3 and 5.10)

- Knowing how and what young people think about industry is a pre-requisite for determining future actions, both for schools and for companies. (Section Three, para. 2)

- School/industry partnership agreements need to recognise the value of increased autonomy for individual schools and training institutes, within clear national frameworks governing curricula and qualifications. Such autonomy enables schools/colleges to adapt courses better to regional requirements in consultation with industry, to respond more quickly to changing needs, and to develop joint projects or courses which utilise local industry-based resources for teaching/learning. (Section Two, para. 5.10)

- The key issues to which school/industry links should be addressed are:

  - strengthening vocational/technical elements in the curriculum
  - developing the teaching of new technologies
  - improving teaching methods and links with guidance
  - increasing integration of education and training in the workplace and working life
  - developing patterns of continuing education and training

- Increased flexibility and articulation is required in education and training, as well as the provision and right of access to continuing education and training. (Section Two, para. 4.2)

- Since, for some companies, school/industry links are part of the firm's recruitment and public relations policies, it could be helpful for teachers to participate in the planning and implementation of these policies. (Section Two, para. 5.8)

- The consistent under-representation of women in industry and technology is a disadvantage to both industry and women, but mainly to industry. Industry needs to re-examine why its image is so low with girls and women. (Section Three, para. 3)

- The links between general education and vocational training need to be made as flexible as possible, allowing students to change from one branch to another. Certificates and diplomas obtained in the vocational field should be recognised as valid entry requirements for secondary and/or higher education. (Section Three, para. 4)

Implementing these policies will require strategies which will vary from Member State to Member State, according to education and training system, current level of partnership between schools and industry, local and regional factors, political will and awareness of the issues

4.3. Actions

IRDAC would like to see the Commission take responsibility for supporting and/or initiating actions in the following areas:

- Actions to Focus on Teacher Awareness and Training
- Actions on the Interface between Schools and Industry
- Actions to Get in touch with Young People

The following menu of practical suggestions for activities to be undertaken at European, national, regional or local level in order to support Member States' strategies to improve school/industry liaison, should assist the Commission in developing this important area of its vocational training policy.

GROUP ONE ACTIONS
FOCUS ON TEACHER AWARENESS AND TRAINING

ACTION 1A **Design pilot initiatives to involve careers guidance teachers in the selection and recruitment activities of industrial firms and to encourage joint training for educational and industrial managers on aspects of management development**

ACTORS	teachers/guidance counsellors; industrial recruitment personnel
ORGANISATION	At local level by a school/industry committee
FUNDING/MONITORING	As schemes funded jointly by education authorities and firms; use where possible, existing liaison mechanisms at local level
EFFECT	To improve teacher understanding of industry's needs To establish a mechanism for practical co-operation and a bridge for mutual understanding To get a better insight into the selection and recruitment practices of firms

ACTION 1B **Investigate, across Europe, the circumstances in which teachers work and their freedom/capacity to innovate and the freedom/capacity to participate in school/industry links**

ACTORS	European Teachers' Unions and professional organisations in collaboration with EURYDICE
FUNDING/ORGANISATION	Co-sponsored by Teachers' Unions and the Commission
MONITORING	By a Steering Group representing the sponsors
EFFECT	To clarify some of the constraints from the educational side to school/industry links

ACTION 1C Develop well structured transnational vocational exchanges for trainees and trainers.

ACTORS	National training agencies and education authorities in conjunction with the TFHR, DG XII, and DG XIII.
ORGANISATION	Through further development of the PETRA Programme
FUNDING/MONITORING	Through existing funding and monitoring arrangements for the PETRA Programme
EFFECT	To improve European co-operation on initial training provision and better adaptation to the needs of industry and those of the Internal Market

ACTION 1D Require that teachers gain a minimum of one year's experience in industry, business, or commerce before they complete their final qualification

ACTORS	National authorities responsible for the training and accreditation of teachers and industrial authorities
ORGANISATION	Establishing a new procedure to become a permanent feature of the teacher training system
FUNDING/MONITORING	Teacher training bodies, teachers' unions, national education authorities, with the co-operation of industry
EFFECT	To improve teacher understanding of industry's needs To establish a mechanism for practical co-operation

ACTION 2A Develop criteria and evaluation strategies for school/industry links

ACTORS	Experts currently involved in the development of school/industry links
ORGANISATION	A network of evaluators from different Member States
FUNDING/MONITORING	EC and National funding / To produce a report in 12 months
EFFECT	The development of tools to assess the value and efficacy of school/industry links

ACTION 2B Draw up a European Bulletin on legislation, agreements and practices which encourage or inhibit school/industry links

ACTORS	Existing national school/industry organisations or bodies with teachers and industrialists
ORGANISATION	Coordinated at national level
FUNDING/MONITORING	By national agencies and industry/chambers of commerce who will be responsible for the regular updating of information
EFFECT	To identify legal and practical barriers to co-operation between schools and industry, e.g. rigid employment structures, imbalance in the teaching profession, teacher autonomy, insurance requirements/restrictions

ACTION 2C **Organise an annual European competition for the Best School/Industry scheme of the Year - Organise a European poster competition on school/industry links**

ACTORS	School/Industry link schemes throughout the Community
ORGANISATION	By CEDEFOP
FUNDING/MONITORING	Co-sponsored by European Industry and the Commission's TFHR
EFFECT	To draw public and media attention to school/industry links

ACTION 2D **Publish a bulletin of good practice in school/industry incentives throughout Europe, including examples of regional sponsorship of schools by industry and fiscal incentives for co-operation by firms**

ACTORS	Network of consultants in Member States, coordinated by European-wide consultancy firm
ORGANISATION	To be circulated through CEDEFOP Flash
FUNDING/MONITORING	Commission's TFHR
EFFECT	To make available information at European level on school/industry practices and how they change over the years

GROUP THREE ACTIONS
GETTING IN TOUCH WITH YOUNG PEOPLE

ACTION 3A **Encourage local and national surveys of young people's attitudes and images of industry and their views on school/industry links and comparing them with those of their parents and their teachers**

ACTORS	Local and national action by employers, local authorities, parents' associations
ORGANISATION	Initially a six month activity, but possibly repeated to provide longitudinal data.
FUNDING/MONITORING	Local funding, supported by national co-ordination
EFFECT	To provide information to be used by industry and education

ACTION 3B **Investigate the motivations and mechanisms through which young people choose their careers in the area of technological studies**

ACTORS	Joint teams of industrialists and teachers
ORGANISATION	At regional or national level in each Member State, using existing school/industry organisations, or creating teams where such organisations do not exist
FUNDING/MONITORING	50/50 EC and National funding, with joint monitoring by the Education Committee and IRDAC/SOCIAL DIALOGUE Groups
EFFECT	Better information at European level on study and career choices, identification of patterns and trends

ACTION 3C **Evaluate the initiatives in different Member States to attract girls and women to careers in industry and report on their success in the national context. Also to look at the effectiveness of such campaigns in increasing industry's acceptance of women**

ACTORS	National agencies for equal opportunities and representatives of industry
ORGANISATION	To be carried out at national level with co-ordination at European level
FUNDING/MONITORING	The Commission's Bureau for Actions in Favour of Women
EFFECT	To identify a range of successful strategies to increase the proportion of women in industry

ACTION 3D **Produce a checklist for publishers of school textbooks for the way in which industry is presented and to use industrial examples where appropriate**

ACTORS	Educational research institute/study contract
ORGANISATION	Activity sponsored by industry in collaboration with national education ministries
FUNDING/MONITORING	Industry sponsored, with monitoring by a steering committee of those involved in the organisation
EFFECT	To raise awareness to negative attitudes portrayed in school books and to involve industry more in the writing of training/technical books of good quality, acceptable to the teaching profession.

Annexes

Annex 1 : List of IRDAC Working Party 11 Members

Chairman of the Working Party : Sir Robert TELFORD - The Marconi Company (UK)

Chairman sub-group "Skills Shortages" : Mr. Erik Van BRUGGEN - Fokker Aircraft (NL)
Secretary : Mr. Wouter Van den Berghe

Chairman sub-group "School Industry Interface" : Mr. Francesco MUSTO - Selenia Industrie (I)
Secretary : Ms. Janet Smith

Other members :

(the members of the sub-group "Schools Industry Interface" are marked with (*))

Mr. Mario BONA (*) - Citta degli Studi (I)
Mr. Damien de CALLATAY - Petrofina (B)
Mr. Anthony G.F. CHAPLIN (*) - Pilkington Plc (UK)
Mr. Xenophon CONSTANTINIDIS - Aluminium de Grèce (GR)
Mr. Pedro CORDOVA (*) - Fundación Centros de Formación y Tecnologia (E)
Mr. Lionel COSSE (*) - Biscuiterie Nantaise (F)
Mr. Keith DAVIES (*) - IBM (B)
Mr. Werner ELLERKMANN (*) - Centre européen de l'Entreprise publique (B)
Mr. Kruno HERNAUT (*) - Siemens A.G. (D)
Mr. Morten KNUDSEN - Teknologisk Institut (DK)
Mr. Pierre LANDRY - Centre de Formation BULL (F)
Mrs. Birgit LUND (*) - Aktieselskabet Hafnia Invest (DK)
Mr. Jean-Marie MELLERY - Olivetti SA Belgium (B)
Mr. Klaus MIDDELDORF (Mr. Klein) - Arbeitsgemeinschaft Industrieller Forschungsvereinigungen e.v. (D)
Mr. Dermott O'COLMAIN - Ericsonn Expertise Ltd. (IRL)
Mr. Jean-Jacques PAYAN (*) - Régie Renault (F)
Ms. Laurien J. POLDER (*) - Shell Internationale Petroleum Maatschappij (NL)
Mr. Fritz RATH (Ms. Theunissen) - European Trade Union Confederation (B)
Mr. Vergilio Rui TEIXEIRA LOPO - Cimentos de Portugal (P)
Mr. Cedric THOMAS (*) - Engineering Employers Federation (UK)
Mme. Marcia TRIGO - Instituto de Inovação Educacional (P)
Mr. Maurice V. WHELAN (*) - Silicon & Software Systems Ltd. (IRL)

Secretariat of Working Party 11 : TFHR, COMETT Technical Assistance Office

Ed Prosser, Wouter Van den Berghe, Janet Smith, Anne Köhler

Commission liaison officials[1]

Robert Jan Smits (DG XII), Richard Delmas (DG XIII), Ricardo Charters d'Azevedo (TFHR)

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[1] Other Commission Officials have attended meetings where appropriate.

The following Annexes contain the examples of school/industry practices and policies considered by the Sub-group and which provide the practical basis for the diagnosis, recommendations and conclusions of this report.

Annex 2 : PETRA - A European Network of Training Partnerships

Annex 3 : Education/Industry Collaboration in Spain

Annex 4 : Progetto 92 - Italy's Vocational Training of the Future

Annex 5 : Improving Industry's Image - The Engineering Council, UK

Annex 6 : The Management of School/Industry Links in the Federal Republic of Germany

Annex 2 : PETRA - A European Network of Training Partnerships

The Commission set up in 1988 a five-year action programme for the vocational training of young people and their preparation for adult and working life (the PETRA Programme). A major aspect of the PETRA Programme has been the establishment of a European Network of Training Partnerships. This Network links projects from the different Member States, to stimulate practical cooperation within the Community and to raise awareness of European aspects of training. More than 150 projects are now engaged in structured bilateral or multilateral cooperation; almost all of them involve the exchange of training staff, two thirds involve exchanges of young people, and 80% are aimed at the joint production of training modules, training or guidance material. To these must be added 90 further projects, which were admitted in 1990 and are now in their preparatory "contact" phase. In total, more than 240 projects are currently receiving financial and technical support from the Commission, to operate within the European Network.

This Network emphasises the importance of school/industry partnership at two levels:

- at national, regional and local level, partnership to mobilise the collective resources of the public, private and voluntary sectors so as to develop a cooperative or integrated approach to vocational education, training and counselling for young people and to promote a climate for effective partnership in the agencies concerned;

- at the European level, partnership designed to increase mutual understanding of common economic and commercial interests of the local areas or regions involved and their cultural and commercial ties, and to active cooperation based on it. This cooperation, which may take many forms, will provide a strong European dimension to the network.

The PETRA Programme has demonstrated its capacity to make a significant contribution to the future development of Member States' policies in the field of initial vocational education and training, by supporting new approaches. The Commission, therefore, intends to propose an enlargement and future development of the PETRA Programme along the following lines of action:

ACTION LINE A. Support for transnational and transfrontier projects aimed at improving initial training, which have a European dimension consisting of:

- vocational exchanges or placements for trainees and trainers;
- joint training of trainers;
- pedagogic and technical cooperation.

ACTION LINE B. Support for innovative national projects on themes of Community importance, in the field of technical and vocational education/training, to enable them to take part in transnational cooperation.

ACTION LINE C. Development of joint European training modules or courses, and of qualifications/certificates related to them.

ACTION LINE D. Development of vocational information and guidance with a European dimension:

- supporting national contact points/centres to network the exchange of guidance data;
- providing training for guidance counsellors/specialists, on European aspects;
- supporting the development of computer-based guidance systems.

Annex 3 : Education/Industry Collaboration in Spain

In Spain the climate is very favourable to the encouragement of effective and extensive cooperation between enterprises and the educational system: this is true of both educational institutions and enterprises. The main problem is the firmly rooted concept of the cultures of these two sectors, which are in fact two different, separate worlds, each with its own objectives and responsibilities, and the relative suspicion that exists between them. But in fact they can achieve effective cooperation as a result of agreements and legislation at national levels.

A new regulation governing Education is currently being prepared in Spain. One of its basic features is matching education to present day society, especially the adaptation of vocational training to the world of work: social upgrading of this type of education, preparation of young people in the areas of work most in demand to help them find their first jobs, possibility for enterprises to find sufficient people with a level and quality of skills suited to current needs in line with the technological and economic development of the country. It should be noted, for instance, that in spite of the fact that there are more than two million people out of work, it is not possible to find suitable candidates for some 200.000 skilled jobs.

In the current negotiations between the Government, employers and trade unions, one of the key points is Vocational Training. Although aimed at resolving questions relating to employment, increased competitiveness and innovation, the negotiations are also covering the question of adapting the educational system to the needs of the labour market, and the collaboration of enterprises in providing practical education. An emergency plan is being incorporated into the Law on Organising the Educational System aimed at young people affected by failure at school, the long-term unemployed and unskilled workers from rural areas. Also included is the reform of the workshop-schools involving labour and legal modifications in order to provide a suitable method of training young people.

There has been a major increase in agreements between enterprises and educational institutions to enable young Vocational Training students (15 to 18 years) or University students to spend periods of time (3 to 5 months) in enterprises carrying out professional activities relating to the academic education they are receiving. At the moment, there are relatively few students who have the opportunity of following this type of training, as the idea of permitting people not belonging to staff to remain in an enterprise for a period of time is not yet very well rooted in enterprise culture. This is probably a consequence of the traditional rigidity in labour relations. Sandwich courses are not recognised as such in the curricula at different educational levels and in educational centres (except for a few centres, particularly private ones, at university and postgraduate levels). Under certain circumstances, the authorities provide economic subsidies and facilities to encourage enterprises to accept students, although most of the practical work by universities is carried out by virtue of bilateral agreements between educational institutions and the enterprises concerned. A major spur for this type of work between enterprises and universities is participation in the development of the ERASMUS exchange programme between European Community countries.

Annex 4 : Progetto 92 - Italy's Vocational Training of the Future

300,000 young people enter the Italian workforce each year without a qualification. "Progetto 92" is designed to remedy this weakness. The experimental programme defines the curriculum requirements to enable all young people to follow a broad, general education in upper secondary school and for those in vocational training schools to be able to continue for a further year in pre-vocational courses, leading to a certificate of "polyvalent" vocational training in one of eight occupational groups.

There is a constitutional requirement in Italy that all students entering upper secondary school should be able to take a course which offers entitlement to university entry. Progetto 92 is no exception and, through agreements between vocational schools and the technical schools, the latter will accept vocational school pupils and prepare them for university.

Responsibility for further training of young people aged 17+ will fall mainly on the regions. This will both broaden and raise the status of the responsibility for the vocational training of young people, currently associated with providing training for young unemployed, drop-outs and those without school leaving certificates.

Courses within the "Progetto 92" programme are based on the following principles:

- the course structure should be modular and its content, pre-vocational rather than vocational. Its purpose is to provide a broad, polyvalent introduction to an occupational area, rather than specific job skills;
- the content of each subject is planned as part of a whole curriculum;
- strong links are to be made between teaching methods and content in general subjects and the pre-vocational studies;
- the courses will reflect the realities of the world outside, showing the relevance of national and local issues and developing strong links between the school and its local and social economic environment;
- opportunities for work experience will be provided in the third year

Particular emphasis is laid on the need to experiment with new links between schools and other training bodies, especially those provided by the Regions. The Regions need to be more aware of what goes on in schools in order to tailor their training provision. There has been a tendency in the past to focus too closely on local industrial needs, without paying sufficient attention to the need to help pupils make a satisfactory transition from the state vocational schools into further training and employment.

Partnership Agreements

Alongside the aim of "Progetto 92" to provide two years of general education for pupils in vocational schools, thus integrating them for a longer period within the school system, is a complementary aim of developing strong partnership agreements with major partners outside the school system: the Regions and the industrial/commercial associations.

To date, agreements have been developed with four industrial/ commercial associations: Confcommercio (the confederation for trade, tourism and services), Fiavet (the federation of travel and tourist agents), Confapi (the federation of small and medium-sized enterprises), and Confartigianato (the federation of craftworkers and craft unions). These Agreements cover:

- national level working groups on curricular questions
- better information to help schools and employers/unions to understand each other's needs and roles and to provide information to the Regions
- the provision of training through the federations
- the development of school/industry links
- the provision of visiting lecturers and experts to help schools
- the support of extra curricular activities for schools
- co-operation to secure more finance for training from the European Social Fund
- the need to involve senior management in support of school curriculum activities
- the development of alternance courses and the provision of summer and holiday courses to introduce pupils to the world of work.

These Agreements have been concluded at national level with industrial/commercial associations, but will lead to local agreements between education authorities and the local branches of the associations. These agreements will, in turn, provide the framework for institutional-level linking between schools and firms.

Annex 5 : Improving Industry' Image - The Engineering Council, UK

In April 1990, the UK Department of Trade and Industry offered up to £612,000 to the Engineering Council as initial pump-priming money to help the national launch of the Council's Neighbourhood Engineers scheme.

Neighbourhood Engineers links three or four engineers and technicians to each secondary school to work - three or four hours a week - in teams with teachers. It aims to provide young people, their parents and teachers with a friendly and informal sources of practical support on matters relating to engineering. It is currently helping teachers deliver the national curriculum and engender an awareness among pupils of the importance that engineering plays in their lives.

The Engineering Council, which already has six secondees from industry working on Neighbourhood Engineers, will be seeking major additional contributions from industry.

The schemes is being set up initially in eight regions of the Council's 19 regions. It is currently active in 450 schools, involving 1,500 engineers and will eventually link 24,000 engineers to 6,000 secondary schools.

> *"The "World of Engineering" needs more talent at all levels of ability. In particular, it must attract more talent at School/College level where the competition is intensifying in line with the decline in the School-leaving population. In order to attract this talent it will have to put itself across as strong, united, successful and professional - offering attractive career prospects and taking a close personal interest in the young people seeking to join it."*

As an example from one region of the UK, The Engineering Liaison Service (West Midlands) has been established to boost the "image" of the "World of Engineering" and to enable it to speak with one, clear voice to Schools/Colleges, students and parents. It is based on a partnership between the Engineering Institutions and the Engineering Council Midlands Regional Organisation (ECMRO) and has a wide support from government and education departments and industrial organisations. Covering the 11 Local Education Authorities (LEAs) of the West Midlands (Birmingham, Coventry, Dudley, Hereford and Worcester, Sandwell, Shropshire, Solihull, Staffordshire, Walsall, Warwickshire and Wolverhampton), TELS (WM) provides a structure for liaising with Schools and Colleges which will ensure that the "World of Engineering" is promoted in a coordinated and coherent manner.

Aims of TELS (WM)

- to coordinate and promote all Engineering/Education activities (including those of the Engineering Institutions and the Engineering Council) in the West Midlands;
- to provide a point of contact for Engineering/Education activities in the West Midlands;
- recruitment and briefing of Link Engineers in conjunction with Regional Engineering Coordinators;
- giving continued local support to Link Engineers;
- liaising with key education-industry and careers staff within the LEA;
- liaising with the Regional Engineering Coordinators;

N.B. The LEA Engineering Coordinator will also look after Link Engineers at Independent Schools in his/her area.

Link Engineer

A link Engineer will be appointed to each Secondary School and College (including Independents) in the West Midlands. The role of the Link Engineer will include liaising between staff in ONE School/College and the many engineering resources available.

Briefing and Support

All Engineers involved in TELS (WM) will be given full support and briefing prior to and during their involvement with the scheme. The system will be dynamic with regular information being sent to LEA Engineering Coordinators and Link Engineers and regular feedback being obtained from them. Included in the support package is a checklist for the use of industry to improve its image with young people:

CHECKLIST OF ACTION IN INDIVIDUAL ENGINEERING COMPANIES

TO IMPROVE THE IMAGE OF ENGINEERING

SERIAL	ACTION REQUIRED	ACTION TAKEN
1.	Cultivate the media	
2.a	Develop a comprehensive "People Plan"	
2.b	Foster an interest amongst individual young people	
2.c	Review recruitment policies	
2.d	Offer worthwhile careers	
2.e	Offer attractive opportunities for girls and women	
2.f	Likewise for ethnic minorities	
2.g	Emphasize your team effort	
3.	Establish strong links with the world of Education	
4.	Strengthen your training function	
5.	Improve your environment and working conditions	
6.	Emphasize Ingenuity - Creativity - Wealth Creation - Added Value	

Annex 6 : The Management of School/Industry Links in the Federal Republic of Germany

Since its introduction in the sixties, as part of a major curriculum reform in lower secondary education, 'Arbeitslehre' (teaching about the world of work) has been the main hinge between the worlds of education and industry.

'Arbeitslehre is something of a paradox. No educational expert, policy maker, trade unionist or employers' representative doubts that all young people, as part of general education, should get an introduction in the basic elements of various careers, economics, home economics and technology. However, at the same time, the integration of these elements into the curriculum seems to cause enormous difficulties'.

Despite the difficulties, about half of all pupils in lower secondary education (i.e. all in 'Hauptschule' and comprehensive schools, 20-25% in 'Realschule' and appr. 10% in 'Gymnasia') come, in some form, in direct contact with industry while they are at school.

Objectives. There are local variations, but 'Arbeitslehre' generally aims to:

- provide students with basic knowledge about, understanding of, and competencies in, many technical, economic and social aspects of working life;
- enhance their understanding of the connection between these economic realities and the political process; and
- provide information about careers opportunities and education and training opportunities.

Organization. 'Arbeitslehre' may be:

- a separate subject;
- a cross-curricular activity; usually across economics, social studies, technology, craftwork and guidance/careers education; or a mix of subject teaching and project work;
- part of existing subjects, designed to help teachers link their subject to other subjects and the world outside.

Duration. The last 3 or 4 years of compulsory education.

Time. From 1 to 8 hours weekly; usually about 4.

Methods. Active, participatory teaching methods are often recommended, e.g. role-play, project work, case studies, lectures by industrialists and mini enterprises. Also group visits to firms, and work experience placements (2-3 weeks in the last year, or 1 day a week for a longer period).

The "Education-Economy Work-group" (Bundesarbeitgemeinschaft Schule-Wirtschaft) is a voluntary organisation of teachers and industrial staff. Since its start in 1953 it has witnessed a tremendous growth: from 1 work group then to about 400 now. From a few teachers then to more then 15,000 participating teachers now.

The network, supported by a three person staff in the central office in Cologne, works at national, regional and local level. The success of the local groups depends on the motivation of the individual teachers and industrialists. Personal contacts are very important. Generally speaking our - the Bundesarbeitsgemeinschaft Schule-Wirtschaft's as an employers' sponsored organisation - public image is related to the labour market situation and the demand for training places. We are now more popular than in the sixties and seventies'.

Different trends can be identified with regard to school industry partnership in the Federal Republic:

- The growing demand from schools for placements and the pressure on staff in firms to provide "quality" experiences has resulted in firms paying more attention to the kind and content of the partnership activities they can handle.

- A second trend is industry's growing interest in bilateral, long lasting with schools. Enterprises and branch organisations, in addition to working with schools indirectly via working groups, are now approaching schools directly more often.

  "My impression is that more and more organisations and firms are sending us information material. At the same time, both small and big firms try to build up direct contacts with us". (a headteacher)

- A third development is linked to firms' entry qualification requirements. Matching school leaving and job entry qualification levels has always been an important part of the school-industry discussions. Again as a result of the demographic situation fresh discussions have started. For a long time, there was a trend to set higher and higher entry levels. This spiral trend is now slowly reversing.